

Species composition of odonata at Udai Sagar Lake (Udaipur, Rajasthan) in non-breeding season

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Abstract

This study represents a comprehensive analysis of species composition of odonates along shoreline of Udai Sagar Lake in non-breeding season. Udai Sagar Lake is lentic perennial wetland habitat. In current study, 5 species under single family (Libellulidae) were reported under dragonflies (Anisoptera), while 4 species under single family (Coenagrionidae) were reported under damselflies (Zygoptera). This study contributes to understand species distribution pattern of odonates and its ecological importance in the Udai Sagar lake. Most dominant species reported was *Brachythemis contaminata* and least dominant species reported was *Orthetrum sabina*. Conservation status of all reported species were found Least Concern (LC).

Keywords: Odonates, anisoptera, zygoptera, dragonflies, damselflies

Introduction

Odonates are predatory, aquatic, diurnal, hemimetabolous insects evolved about 300 million years ago (Grimaldi and Engel, 2005; Bose *et al.*, 2025) ^[3]. The evolutionary origin of Odonata occurred in the Jurassic, while the Cretaceous was critical period for the radiation of main Odonata lineages (Weidong *et al.*, 2025) ^[29]. Adult odonates are carnivores and insectivores and perception for predation. Odonata word derived from Greek word “*odontos*” due to presence of toothed mandibles which are very versatile multifunctional tool (Angelika and Reinhard, 2025) ^[1]. The order Odonata includes Anisoptera (dragonflies) and Zygoptera (damselflies) (Kalkman *et al.*, 2008) ^[13]. Odonates are agile fliers with great manoeuvre ability (George and Dagmar, 2025). Their life cycle includes egg, larva (nymph or naiad) and adult stages. Nymphs are aquatic and adults are aerial and terrestrial. Adults are sexually dimorphic. During mating, male grasps the female by the thorax or head and female bends her abdomen towards male genitalia. This is called mating wheel position. They are crucial part of aquatic food web and bioindicators of aquatic water bodies (Corbet, 1999) ^[6] as well as radioactivity (Vukoja *et al.*, 2024). Most studies on odonates are done in Western Ghats of India (Koparde *et al.*, 2025) ^[15]. They are significant biocontrol agent which feeds on harmful insects such as mosquitoes (Olberg *et al.*, 2007). They are also consumed as food in some parts of the world (Siddiqui *et al.*, 2024) ^[23]. There is clear distinction between Zygoptera (damselflies) and Zygoptera (dragonflies). Zygoptera have similar fore and hind wings, more slender body, eyes placed apart and wings folded together at rest. Anisoptera have unequal fore and hind wings, bulkier body, eyes fused and wings spread out at rest (Mischiati *et al.*, 2015) ^[16]. Odonates show very diverse colors in both adult wings and body. Odonates are diurnal insects with well-developed vision and their body color is essential for recognizing each other. Odonates drastically change their color from brownish dull-colored aquatic larvae to colorful terrestrial adults without pupal stage. Many Odonates have sexual color dimorphism and change their color through sexual maturation. Some Odonates exhibit color polymorphism within the same sex, mostly in females (Genta and Ryo, 2021).

Materials and Methods

Random sampling was done over seven sampling sites along the shoreline of the lake according to feasibility. Sampling was done in non-breeding season (March-May, 2025) on purpose to compare it with future study in breeding season (July-September). Best time of sampling is 1 PM to 5 PM (Cazzola *et al.*, 2025) ^[5]. Sampling on each site was done using transect method (100m² area). Adults were collected using butterfly net. Photographs were taken on site using Nikon Coolpix p1100 digital camera (24-3000 mm lens). After collection taxonomic identification was done in the Laboratory using field guide and taxonomic keys (Dheerendra, 2022; Subramanian, 2014) ^[25].

Study Area

Udai Sagar lake (24.5708°N and 73.8213°E) is eutrophic, polymictic perennial lake located in north of udaipur region in Rajasthan State (Fig. 1). Altitude of this lake is 578-meter asl. It is situated in Aravalli region. This lake is primarily filled by Ahar River. Surrounding terrestrial habitat is scrubland vegetation. It is one of the artificial lake built by Maharana Udai Singh. Its shoreline length is approximately 13 km and area is approximately 11 km². Shoreline development index of this lake is 1.4102 (Bhatta and Sharma, 2018) ^[2].

Results and Discussion

After collection of 94 specimens, specimens were reported under 2 families, 6 genera and 10 species (Table 1 and Graph 1). Out of which 1 family, 2 genera and 4 species were reported under suborder Zygoptera (damselflies), while 1 family, 4 genera and 5 species were reported under suborder Anisoptera (dragonflies). Their dispersion pattern was found random. 3 (2 dragonfly and 1 damselflies) individuals were not identified beyond suborders. Highest number of individuals were from *Brachythemis contaminata* and lowest number of individuals were from *Orthetrum sabina*. Globally there are 6453 species under 46 families are recorded up to May, 2025 (Paulson and Schorr, 2024). In india total 504 species were recorded under 157 genera and 17 families. In Rajasthan, 51 species were recorded (Subramanian and Babu, 2024). Conservation status of all reported odonates are Least Concern (LC). In previous

studies many species which were found in this lake are found absent in non-breeding season (Koli *et al.*, 2014) [14] However it would be compared with future study done by us

in breeding season. This lake is important habitat for local freshwater biodiversity which includes species of regional significance.

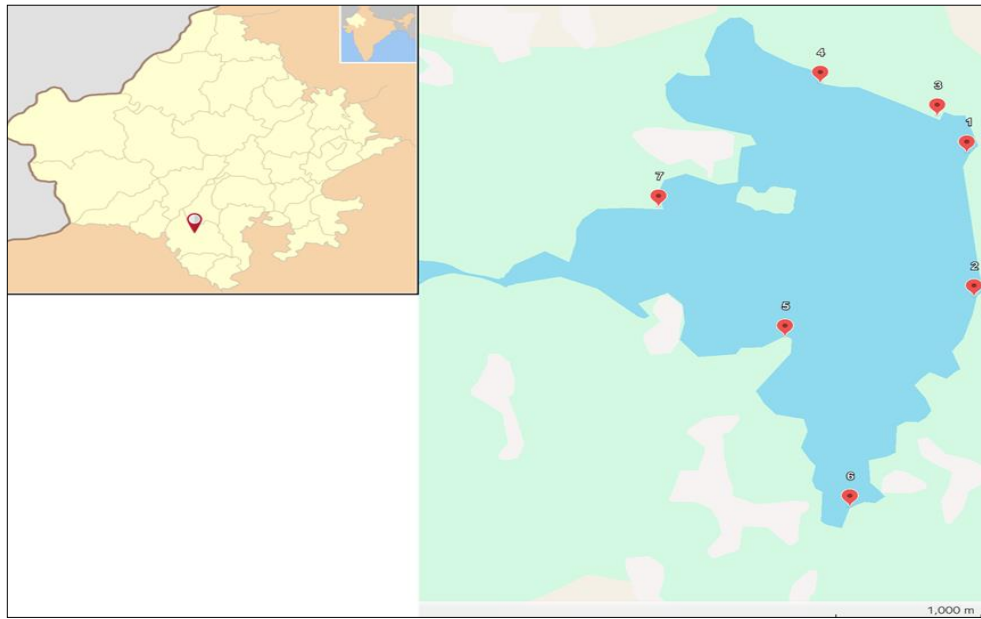


Fig. 1: Map of Udai Sagar Lake with marked sampling sites.

Table 1: Species composition of odonates in Udai Sagar lake

Suborder	Family	Species	(N)	Conservation status
Zygoptera (Selys, 1854)	Coenagrionidae (Kirby, 1890)	Agriocnemis femina (Brauer, 1868)	6	LC (Dow, 2020)
		Agriocnemis pygmaea (Rambur, 1842)	9	LC (Subramanian, 2020)
		Ceriagrion coromandelianum (Fabricius, 1758)	2	LC (Dow, 2009)
		Ceriagrion olivaceum (Laidlaw, 1914)	7	LC (Mitra, 2010)
		Not identified	1	
Anisoptera (Selys, 1854)	Libellulidae (Leach, 1815)	Brachythemis contaminata (Fabricius, 1793)	22	LC (Sharma, 2010)
		Indothemis carnatica (Fabricius, 1798)	2	LC (Dow, 2019)
		Orthetrum sabina (Drury, 1770)	1	LC (Mitra, 2020)
		Trithemis aurora (Burmeister, 1839)	13	LC (Subramanian & Dow, 2010)
		Trithemis kirbyi (Selys, 1891)	12	LC (Boudot, 2016)
		Trithemis pallidinervis (Kirby, 1889)	17	LC (Subramanian, 2010)
		Not identified	2	

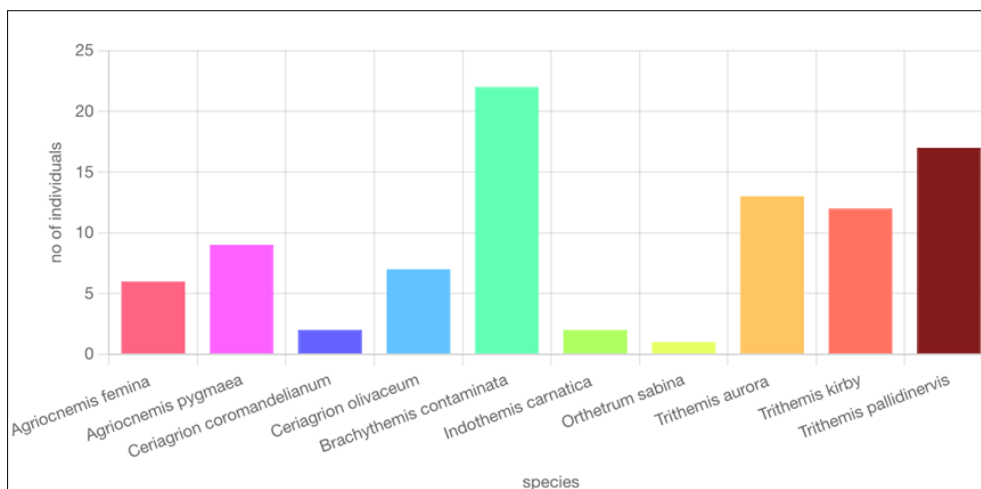


Fig 1: Bar graph showing relative abundance of odonate species.

Conclusion

In this study, we found approximate 20% of species of odonates of total recorded species from Rajasthan, which is significant. 4 species of damselflies under 2 genera and

single family were reported, while 6 species of dragonflies under 4 genera and single family were reported. All species are listed under Least Concern (LC) category of IUCN red list. Udai Sagar Lake sustains diversified odonate groups,

which indicates its rich biodiversity. Aravalli hills region stands out as a crucial hotspot for biodiversity. Future research should concentrate on bridging the gaps in our understanding of taxonomy, population dynamics and ecology of odonates in this area and vicinity. The Odonate history of India must be conserved for future generations through community involvement, habitat restoration projects, and long-term monitoring programs.

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